

PATENT APPLN. NO. 10/590,442
RESPONSE UNDER 37 C.F.R. §1.111

PATENT
NON-FINAL

REMARKS

Claim 1 has been amended to include the limitations of claims 5, 8 and 9. Claims 5, 8 and 9 have been canceled. Claims 6 and 7, which recite a curing agent other than dicyandiamide, have also been canceled. Claim 10 has been amended to depend on claim 1.

The claims as amended are patentably distinct under 35 U.S.C. § 102 and 35 U.S.C. § 103(a) over the prior art and, particularly, the prior art cited in the Action.

The Present Invention

The subject matter of the present invention as defined in claim 1 as amended is an epoxy resin composition comprising components [A] to [D]. Component [B] is an amine curing agent which is limited to dicyandiamide. Component [D] is a curing accelerator which is limited to a compound that has 2 or more urea bonds per molecule.

The claimed epoxy resin composition comprising the combination of dicyandiamide as component [B], phosphorus compound as component [C] and a compound that has 2 or more urea bonds per molecule as component [D] has an advantageous effect that a thin carbon-fiber-reinforced composite material (CFRP) having a thickness of 0.2 mm to 0.6 mm comprising the epoxy resin composition has unexpectedly high flame retardance.

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The unexpectedly high flame retardance of the epoxy resin composition of the present invention comprising the combination of dicyandiamide as component [B], phosphorus compound as component [C] and a compound that has 2 or more urea bonds per molecule as component [D] is supported by the results of the example of the present application. The attention of the Office is directed to Tables 1, 2 and 6, in which the epoxy resin compositions of Example 6-12 and 22-27 have flame retardance that meet the requirement of V-0 (Examples 6-12, 22, 23, and 24 (for 0.4 mm- and 0.6 mm-thick test pieces) and 25-27) or V-1 (Example 24 for a 0.2 mm-thick test piece) specified in UL-94 for test pieces having a thickness of 0.2 mm to 0.6 mm, whereas the epoxy resin compositions of Examples 1-5 and 13-17 do not have acceptable flame retardance for test pieces having a thickness of 0.2 mm to 0.6 mm. Example 6-12 and 22-27 use DICY7 as component [B], which is dicyandiamide, and OMICURE 24 or OMICURE 52 as component [D], which is a compound that has 2 or more urea bonds per molecule. On the other hand, Examples 1-5 and 13-17 use DICY7 as component [B], but use DCMU-99 as component [D]. DCMU-99 is a compound that having one urea bond per molecule.

A person of ordinary skill in the art could not have reasonably expected or predicted that the claimed epoxy resin composition comprising a compound having 2 or more urea bonds per

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molecule as a curing accelerator would have high flame retardance even when it is formed into a thin carbon-fiber-reinforced composite material (CFRP).

Additionally, the claimed epoxy resin composition provides the further advantageous effect of having a short curing time, being able to be cured at 150 to 160 °C for about 2 to 10 minutes. (Please refer to page 13, line 22 to page 14, line 2, of the present specification).

Referring to the Action, the amendments to the claims overcome the rejection of claims 1, 3-5, 7 and 8 under 35 U.S.C. § 102(b) as being anticipated by Honda et al., US 5,994,429 ("Honda"); the rejection of claims 2, 11 and 12 as being anticipated by or, in the alternative, as being obvious over Honda; the rejection of claim 6 under 35 U.S.C. § 103(a) as being unpatentable over Honda in view of Goto et al., US 2003/0135011 ("Goto"); and the rejection of claims 13-16 under 35 U.S.C. § 103(a) as being unpatentable over Honda in view of Middleman, US 5,269,863. Each of these rejections is based on the sufficiency of Honda to support anticipation of claim 1. However, claim 1, as noted above, has been amended to include the limitation of claim 9. Claim 9 is not rejected in the Action as being anticipated by Honda.

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The claims as amended are also patentable under 35 U.S.C. § 103(a) over the combination of Honda and Qureshi et al., US 5,087,657 ("Qureshi") cited in the 35 U.S.C. § 103(a) rejection of claims 9 and 10.

The position of the Office is that Honda discloses that the composition of its invention can include any curing accelerator, as long as it is generally used in accelerating curing of an epoxy resin, and that Qureshi teaches that urea-based accelerators are recognized in the art as suitable accelerators for an epoxy-based system.

Applicants respectfully submit that the Office has not properly supported prima facie obviousness of the claims of the application as amended. More is required than a general, unsupported, allegation that it would have been obvious to use any known curing accelerator as a curing accelerator in the composition of Honda. The Office must provide proper reasoning or evidence showing that the person of ordinary skill in the art would have expected the use of a compound that has 2 or more urea bonds per molecule to provide good results when used in a composition as disclosed in Honda which is a specific combination of an epoxy resin, dicyandiamide, and a phosphorus compound.

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Moreover, neither Honda nor Qureshi discloses or suggests that the flame retardance of an epoxy composition which is a specific combination of an epoxy resin, dicyandiamide, and a phosphorus compound will have improved flame retardance when a compound having 2 or more urea bonds per molecule is combined therewith. Honda discloses a composition comprising an epoxy resin, a curing agent which may be dicyandiamide, and a phosphorus compound which may be red phosphorus. However, Honda discloses nothing about the addition of a compound that has 2 or more urea bonds per molecule as a curing accelerator for the purpose of accelerating curing of dicyandiamide. Honda neither suggests nor teaches that the use of the curing accelerator would improve the flame retardance of the epoxy composition.

Qureshi discloses a CFRP prepared with the use of an epoxy resin composition comprising an epoxy resin, a diamine hardener, which may be an aromatic diamine, and an accelerator, which may be a compound that has 2 or more urea bonds per molecule ("OMICURE 52" is mentioned in the reference), to increase the rate of cure. However, Qureshi discloses nothing concerning improvement of flame retardance.

A person of ordinary skill in the art could not have reasonably predicted or expected that a combination as recited in

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the claims of the present application as amended is effective in improving flame retardance of an epoxy resin composition. The compound having 2 or more urea bonds per molecule had been merely known as a curing accelerator.

The foregoing is believed to be a complete and proper response to the Office Action dated June 23, 2009.

In the event that this paper is not considered to be timely filed, applicants hereby petition for an appropriate extension of time. The fee for any such extension may be charged to our Deposit Account No. 111833.

In the event any additional fees are required, please also charge our Deposit Account No. 111833.

Respectfully submitted,
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